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"HYPERCONNECTED" ADOLESCENTS: SEDENTARY SCREEN TIME ACCORDING TO GENDER AND TYPE OF DAY

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ABSTRACT

The research objective was to know the mean daily usage time of screen-based devices (Television [TV], computer, video games, and mobile phone), as well as compliance with screen time recommendations for these devices. Likewise, the differences in the four electronic devices were examined according to gender and type of day (i.e., weekdays and weekend). A total of 2021 adolescents (*M age*=14.23; *SD*=1.58; 51% female) completed a questionnaire on regular screen time usage. The young people reported a mean daily screen usage of 6 hours and 12 minutes, with 4% of them meeting screen time recommendations (<2 hours/day). No differences in total screen time usage were obtained according to gender. However, boys obtained higher values in the use of video games, while girls obtained higher values in the use of mobile phones and computers. Adolescents reported higher screen time values at weekends than on weekdays in terms of all four electronic devices analysed. On the basis of the high daily screen usage time, developing strategies towards the responsible use of video games in boys, and mobile phones and computers in girls, seems necessary, placing emphasis on weekend days.

Keywords: screens, sedentary time, recommendations, television, video games, mobile phone, computer

ADOLESCENTES "HIPERCONECTADOS": TIEMPO SEDENTARIO DE PANTALLA EN FUNCIÓN DEL GÉNERO Y EL TIPO DE JORNADA

RESUMEN

El objetivo del estudio fue conocer el tiempo medio de uso diario de cuatro medios tecnológicos de pantalla (MTP) (TV, ordenador, videojuegos y teléfono móvil), así como el cumplimiento de las recomendaciones de pantalla en dichos dispositivos. Asimismo, se examinaron las diferencias en los cuatro MTP en función del género y el tipo de jornada. Un total de 2021 adolescentes (*M edad*=14.23; *DT*=1.58; 51% chicas) cumplimentaron un cuestionario sobre el uso habitual de tiempo de pantalla. Los jóvenes reportaron un uso medio diario de pantalla de 6 horas y 12 minutos, cumpliendo un 4% las recomendaciones de tiempo pantalla (<2 horas/día). No se obtuvieron diferencias en el tiempo de uso total de pantalla en función del género. Sin embargo, los chicos obtuvieron valores superiores en el uso de videojuegos, mientras que las chicas obtuvieron valores superiores en la utilización del teléfono móvil y el ordenador. Durante el fin de semana, los adolescentes reportaron valores superiores de tiempo pantalla, en los cuatro MTP analizados, que entre semana. En base al elevado tiempo de uso diario de pantalla, parece necesario el desarrollo de estrategias en el uso responsable de videojuegos en los chicos y en el teléfono móvil y el ordenador en las chicas, haciendo énfasis en los fines de semana.

Palabras clave: pantallas, tiempo sedentario, recomendaciones, televisión, videojuegos, teléfono móvil, ordenador

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INTRODUCTION

According to the Spanish National Institute of Statistics (Spanish acronym, INE, 2017), information and communication technology usage in the child-youth population (i.e., 10 to 15 years old) is very high. More specifically, the increase in use of mobile devices, from increasingly earlier ages, is giving rise to great concern in the scientific community. Although it is true that many studies have analysed sedentary screen time in more traditional electronic devices (e.g., television [TV] and computer), the appearance and usage of new technological screen media (i.e., smartphones and tablets) may have caused changes in usage time (Thomas, Bennie, De Cocker, Castro, & Biddle, 2019). For example, do today's adolescents use the mobile phone more, to the detriment of using computers? According to previous studies, the percentage of children over the age of 10 who have mobile phones has progressively increased, reaching 94% in 15-year-old youths (Anderson & Jiang, 2018; INE, 2017). This early access to mobile telephony has additionally generated a high consumption of Internet content in the adolescent population. For example, in the Distrendia report, it was observed that 99% of young people access the Internet every day through their mobile phones (Digital Marketing Trends, 2017). As a result of the appearance of new electronic devices and the potential inadequate usage made of them (e.g., access to harmful contents, or development of non-healthy behaviours) (Domoff, Borgen, Foley, & Maffett, 2019), many national and international health-related organisations have underlined the importance of young people satisfying the existing screen time recommendations to limit their use. More specifically, both the Spanish Ministry of Health, Social Services and Equality (2015) and some international organisations, such as the American College of Sports Medicine (2015), recommend that children and adolescents aged between 5 and 17 should not exceed 2 daily hours of sedentary screen time.

Despite the different organisations establishing screen time recommendations, many adolescents exceed the established limit. For example, a recent systematic review that analysed 130 studies, pointed out that sedentary screen time in children and adolescents aged between 5 and 18 amounted to approximately 3 hours and 30 minutes per day, and that video games were the most commonly used electronic devices by these young people. Moreover, the study determined that 52.3% of adolescents did not meet screen time recommendations (Thomas et al., 2019). In another study, on a sample of 42355 young Canadians, which assessed the time spent watching TV, playing video computer games, talking on the telephone, browsing the Internet, and sending text messages, adolescents acknowledged daily mean screen usage time of 8 hours and 42 minutes per day (Williams, Battista, & Leatherdale, 2019). At a national level, one study determined that secondary school students

spend an average of 4 hours and 40 minutes a day using different electronic devices (i.e., TV/video/DVD, computer, video games, and mobile phone) and that the TV was the most used, followed by video games (Lizandra, Devís-Devís, Valencia-Peris, Tomás, & Peiró-Velert, 2019). On the other hand, the ANIBES study, assessed sedentary screen time (i.e., TV, computer games, video game console, browsing the Internet for academic reasons, browsing the Internet for other reasons, and studying outside school hours) in 424 children and adolescents. The results determined that 48.4% of the young people exceeded the 2 daily hours of recommended screen time (Mielgo-Ayuso et al., 2017).

The high screen time values found are especially concerning as they are negatively related to young people's physical, psychological, and social health (Domoff et al., 2019). In this sense, there is scientific evidence that maintains that high sedentary screen time usage reduces the time spent on other health-related behaviors such as physical activity (Auhuber, Vogel, Grafe, Kiess, & Poulain, 2019; Fomby, Goode, Truong-Vu, & Mollborn, 2019; Lizandra et al., 2019) and sleep duration (Hale & Guan, 2015; Mei et al., 2018). Likewise, recent systematic reviews and meta-analyses have shown that young who do not meet screen time recommendations have a greater likelihood of being overweight or obese in the under-18s (Fang, Mu, Liu, & He, 2019; Stiglic & Viner, 2019; Tripathi & Mishra, 2019). Moreover, a positive association has been found between the use of different electronic devices and stress or anxiety (Stanczykiewicz et al., 2019), as well as a negative association between the time spent watching TV or playing video games, and academic performance in young people (Adelantado-Renau et al., 2019). At a social level, Carson et al. (2016), revealed that high screen time usage, specifically of the television and video games, was associated with less social interaction.

Although it is true that previous studies have determined that more than half the young people do not meet the screen time recommendations, the rapid evolution of the 21st century society creates the need to carry out studies to be able to determine the possible differences according to gender and type of day (i.e., weekdays and weekend). Existing studies, which have analysed possible differences in sedentary screen time, as well as in the different electronic devices, according to gender, have given rise to mixed results (Aros, Germano-Soares, Silva, Silva, & Tassitano, 2017; Twenge, Martin & Spitzberg, 2019). For example, one recent systematic review on children and adolescents aged 5 to 19 years old indicated that in 19 out of the 23 studies analysed boys spent more sedentary screen time than girls, while in 2 of the 23 studies, the opposite occurred (Tripathi & Mishra, 2019). In the other two remaining studies included in the review, there were no differences according to gender (Tripathi & Mishra, 2019). However, in another recent systematic review on children and adolescents aged 5 to 19 years old, no differences were found between boys

and girls in terms of compliance with screen time recommendations. Nevertheless, it was observed in the analyses that, depending on the type of electronic devices, boys spent more time on computers and playing video games, while girls spent more time using mobile phones (Thomas et al., 2019). At a Spanish national level, the PASOS study assessed the screen time usage in 3083 Spanish children and adolescents aged between 8 and 16, in five electronic devices (i.e., TV, computer, tablet, video game console, and mobile phone), finding that boys spent more time using electronic devices than girls (Fundación Gasol, 2018). These results suggest the need to continue conducting studies on the use of electronic devices according to gender.

With respect to the type of day, most studies have pointed out that compliance by adolescents of screen recommendations, and in the different electronic devices, is lower at weekends than on weekdays. For example, in a previous study carried out by Aros et al. (2017), 30% and 17% of young people aged 15 to 20 years did not meet, respectively, TV and computer/video game time recommendations (<2 hours/day) on weekdays. However, these non-compliance percentages increased to 68.3% and 59.2%, respectively, at weekends (Aros et al., 2017). At a Spanish national level, the PASOS study indicated that 54.5% of young people on weekdays and 79.3% at weekends, did not comply with screen time recommendations (<2 hours/day) (Fundación Gasol, 2018). In this vein, the ANIBES study revealed that 49.3% of young people did not meet screen time recommendations on weekdays. At weekends, however, this figure increased to 84% (Mielgo-Ayuso et al., 2017). With respect to non-compliance with screen time recommendations in terms of each electronic device (i.e., also considering the recommendations of <2 hours/day), and the differences according to type of day, this is also greater at weekends than on weekdays. For example, in the study by Mielgo-Ayuso et al (2017), failure to comply with TV screen time recommendations was greater at weekends (49.8%) than on weekdays (25.1%). Likewise, the percentage of adolescents who did not comply with video game console screen recommendations was greater at weekends (17.9%) than on weekdays (5.1%) (Mielgo-Ayuso et al., 2017).

Contributions and objectives of the present study

As new electronic devices have emerged during this second decade of the 21st century, such as smartphones, that are permanently connected to the Internet and have new usage functionalities (i.e., alarm, camera, diary, social media, chat, etc.) (Borzekowski, 2019), it seems necessary to continue to study the daily time spent on the different electronic devices in a stage such as adolescence, when there is an increased use of these devices (Arundell, Fletcher, Salmon,Veitch, & Hinkley, 2016). The analysis of mobile phone usage time

represents a great contribution to literature, as a recent systematic review pointed out that, from 2000 to 2017, only 4.6% of the studies on screen time have assessed this device (Thomas et al., 2019). Likewise, the disparity in results related to the use of the different electronic devices, as well as to the possible differences according to gender, justify the development of more studies on this topic (Rosenberg et al., 2018). Moreover, although literature indicates, in most of the studies, that adolescents spend more sedentary screen time at weekends, more studies seem necessary to analyse the daily time spent on the different electronic devices, especially mobile phones, according to the type of day.

In this sense, the present study address each of the following research questions: how much time per day do adolescents dedicate to screens? Are there differences of usage in the different electronic screen devices? Are there differences in sedentary screen time according to gender and type of day? Consequently, the first research objective was to analyse, in four electronic screen devices (i.e., TV, computer, video games, and mobile phone), the mean daily sedentary usage time, and compliance with the recommendations in each one of them, and in all of them together. The second research objective was to examine the possible differences in usage of these screen-based devices according to gender and type of day (i.e., weekdays and weekend).

METHOD

Participants

A cross-sectional descriptive study was carried out with the participation of a total of 2021 students (*M age*=14.23; *SD*=1.58; 51% girls), with ages varying between 12 and 17 years old, from seven of the eight state and state-funded schools in the city of Huesca. More specifically, 397 1st-year secondary education (Spanish acronym, ESO) (19.7%), 456 2nd-year of secondary education (22.6%), 327 3nd-year of secondary education (16.2%), 434 4nd-year of secondary education (21.5%), and 402 1st-year *Bachillerato* (A-level equivalent) (19.9%) students participated. Families and students voluntarily signed informed consents to participate in the study, which had previously been approved by the Research Ethics Committee of the Region of Aragon (Spanish acronym, CEICA).

Instrument

Daily average screen time of different sedentary screen time behaviours (i.e., TV, computer, video games, and mobile phone) was measured through a self-reported questionnaire (Rey-López et al., 2011; Sánchez et al., 2018), both on weekdays and at weekends. The mean obtained from the daily weekday and weekend time was used to calculate the mean daily screen usage time of each

electronic device. The total daily minutes of sedentary screen time were calculated by summing the daily means of each one of the four electronic devices.

Data Analysis

Firstly, the descriptive statistics were calculated (i.e., mean, standard deviation, and percentages) of the four electronic devices (i.e., TV, computer, video games, and mobile phone). The screen time recommendations were considered (i.e., <2 hours screen time/day; American College of Sports Medicine, 2015) to examine the degree of compliance with screen time. Likewise, and in agreement with previous studies (Mielgo-Ayuso et al., 2017), compliance with screen time recommendations was also analysed in each one of the electronic devices. To determine the differences according to gender and type of day, univariate variance analyses (ANOVAs) were performed on the usage time of the four electronic devices. The Chi-square test (x^2) was used to learn the degree of association between gender and compliance with screen time in the devices analysed. Cramer's V-coefficient was used to estimate the effect size. Finally, the differences in compliance with the screen time recommendations were calculated according to the type of day, using McNemar test. All the statistical analyses were performed with the SPSS 21.0 program.

RESULTS

The descriptive statistics of the daily TV, computer, video game, and mobile phone time, as well as differences by gender and type of day, are reported in Table 1. Adolescents from the present study reported a mean of 6 hours and 12 minutes' screen time per day. The mobile phone is the most used electronic devices both at weekends and on weekdays, followed by the TV, video games, and computers. This order in the usage time frequency of these electronic devices is maintained in girls, but not in boys, who use the mobile phone the most, followed by video games, TV, and computers. Respect to the type of day, significantly higher values in total mean daily screen time are observed at weekends, as well as in the mean daily usage time of the four electronic devices (i.e., TV, computer, video games, and mobile phone), compared to weekdays. Regarding gender, boys present significantly higher values than girls in mean average daily usage time of video games both on weekdays and at weekends. On the other hand, girls obtain significantly higher values than boys in mean daily usage time and in mean weekday usage time of computers, as well as mean daily usage time of mobile phones on weekdays and at weekends.

TABLE 1
Descriptive statistics of the daily time of TV, computers, video games, and mobile phones: differences by gender and type of day.

Study variables	Total (M±SD)	Boys (M±SD)	Girls (M±SD)	F-value/η_p^2
Daily minutes (min/day) of TV	90.44±61.22	91.92±60.63	89.09±61.99	1.06 / .001
Min/day of TV on weekdays	76.16±60.64	78.79±59.98	73.63±61.38	3.60 / .002
Min/day of TV at weekends	126.16±83.99**	124.75±86.28	127.75±82.37	0.62 / .000
Min/day of video games	86.44±79.87	106.31±78.49	68.52±77.24	117.18** / .056
Min/day of video games on weekdays	70.81±73.80	84.78±73.61	58.49±70.07	64.71** / .032
Min/day of video games at weekends	125.73±114.93**	160.33±115.19	93.84±105.59	180.06** / .083
Min/day of computer	51.50±53.27	48.61±51.61	53.85±55.01	4.79* / .002
Min/day of computer on weekdays	46.68±52.49	43.67±50.92	49.08±54.01	5.29* / .003
Min/day of computer at weekends	63.57±68.31**	60.99±67.23	65.79±69.94	2.43 / .001
Min/day of mobile phone	145.53±102.28	130.35±95.13	161.10±107.56	45.23** / .022
Min/day of mobile phone on weekdays	129.96±97.86	117.20±92.30	143.09±102.33	34.85** / .017
Min/day of mobile phone at weekends	184.46±129.61**	163.26±117.65	206.12±138.06	55.07** / .027
Total min/day of screen time (sum of the 4 electronic devices)	372.33±156.87	376.49±159.56	370.10±155.24	0.82 / .000
Total min/day screen time on weekdays	322.18±154.40	323.79±157.35	322.06±152.48	0.06 / .000
Total min/day screen time at weekends	497.74±205.812**	508.26±209.08	490.23±203.88	3.80 / .002

*Note: * = p < 0.05; ** = p < 0.01. The comparison between the daily minutes of each one of the technology screen media has been carried out on the whole sample according to type of day (i.e., weekdays or weekend).*

Table 2 shows compliance with the recommendations of the four electronic devices analysed, as well as the differences per gender and type of day. Only 4% of the adolescents from the sample comply with screen recommendations (i.e., this includes the sum of the four electronic devices assessed in the present study). Specifically, 9.6% comply with screen time recommendations on weekdays, and only 2.3% at weekends. Regarding compliance with screen time

recommendations on the usage of each electronic device, we have found that the least satisfied screen recommendations are related to the usage of mobile phones (51.9%), followed by video games (30.4%), TV (28.3%), and computers (10.5%). Non-compliance with the recommendations in these electronic devices maintains the same tendency on weekdays and at weekends. These patterns in terms of non-compliance with recommendations for the different electronic devices are maintained identically in boys, but not in girls, who comply less with the mobile phone (49%) and TV (27.4%) recommendations. Respect to the type of day, it can be observed that compliance with screen recommendations is significantly greater in terms of the total daily mean screen time, as well as in the four electronic devices, on weekends than at weekends. Regarding gender, a positive and significant relationship is noticed between compliance with TV recommendations on weekdays and video games (i.e., total, weekdays, and weekend) and the female gender. On the other hand, there is a positive and significant relationship between the male gender and compliance with computer and mobile phone recommendations (i.e., total, weekdays, and weekend).

TABLE 2
Compliance with the screen time recommendations in TV, computer, video games and mobile phone: differences per gender and type of day.

Study variables	Total	Boys n (%) ra	Girls n (%) ra	*x2(df)* / V
Compliance with TV recommendations (≤2 hours/day)	1448 (71.7%)	693 (70.9%) -0.8	738 (72.6%) 0.8	.717(1) / .019
Compliance with TV recommendations on weekdays (≤2 hours/day)	1770 (87.6%)**	843 (86.2%) -2.2	910 (89.5%) 2.2	5.040(1)* / .050
Compliance with TV recommendations at weekends (≤2 hours/day)	1260 (62.4%)	611 (62.5%) 0.2	632 (62.1%) -0.2	.023(1) / .003
Compliance with video game recommendations (≤2 hours/day)	1404 (69.6%)	605 (61.9%) -7.0	775 (76.4%) 7.0	49.648(1)** / .158
Compliance with video game recommendations on weekdays (≤2 hours/day)	1674 (83.2%)**	781 (79.9%) -3.7	869 (86.0%) 3.7	13.460(1)** / .082
Compliance with video game recommendations at weekends (≤2 hours/day)	1245 (61.8%)	490 (50.1%) -10.1	731 (72.2%) 10.1	102.594** / .227
Compliance with computer recommendations (≤2 hours/day)	1804 (89.5%)	888 (90.9%) 2.1	892 (88.0%) -2.1	4.484(1)* / .047

Compliance with computer recommendations on weekdays (≤2 hours/day)	1897 (93.9%)**	922 (94.4%) 0.6	951 (93.8%) -0.6	.304(1) / .012
Compliance with computer recommendations at weekends (≤2 hours/day)	1745 (86.3%)	853 (87.3%) 1.1	868 (85.6%) -1.1	1.236(1) / .025
Compliance with mobile phone recommendations (≤2 hours/day)	963 (48.1%)	538 (55.3%) 6.4	412 (41%) -6.4	40.489(1)** / .143
Compliance with mobile phone recommendations on weekdays (≤2 hours/day)	1274 (63.6%)**	670 (68.9%) 5.1	580 (57.7%) -5.1	26.414(1)** / .116
Compliance with mobile phone recommendations at weekends (≤2 hours/day)	900 (45.0%)	500 (51.4%) 5.8	387 (38.5%) -5.8	33.158(1)** / .129
Compliance with screen time recommendations (total sum of the 4 electronic devices; ≤2 hours/day)	81 (4%)	41 (4.2%) 0.3	40 (3.9%) -0.3	.086(1) / .007
Compliance with screen time recommendations (total sum of the 4 electronic devices; ≤2 hours/day)	193 (9.6%)**	100 (10.2%) 1.1	89 (8.8%) -1.1	1.263(1) / .025
Compliance with screen time recommendations (total sum of the 4 electronic devices; ≤2 hours/day)	26 (2.3%)	21 (2.1%) -0.5	25 (2.5%) 0.5	.214(1) / .010

*Note: * = p < 0.05; ** = p < 0.01. ra = adjusted residuals. The comparison between compliance with the recommendations for each one of the technological screen media has been carried out on the entire sample according to type of day (i.e., weekdays and weekend). Significance is marked in the type of day with highest value.*

DISCUSSION

The use of electronic devices by young people has undergone a considerable increase over the last 10 years (Bucksch et al., 2016; Twenge et al., 2019), especially with the appearance of new electronic devices such as mobile phones or of new usage of these devices (Thomas et al., 2019). These changes, caused by the relentless technological development in developed countries, give rise to the need to continue examining screen time usage of different electronic devices by young people. The findings may help to advance in this field of knowledge, identifying the most used electronic devices today. As a result, the first research objective was to find out the mean daily usage time of four electronic devices, and identify the degree of compliance with screen time of each one of them, and of all of them together.

The mean screen time values reported by young people in this study are deeply troubling as they are way above those found in previous studies, both at an international and a national level. For example, in a recent systematic review, which analysed 130 studies, children and adolescents aged 5 to 8 years old reported sedentary screen time of approximately 3 hours and 30 minutes a day

(Thomas et al., 2019). However, there are some more recent international studies, such as the one carried out by Williams et al. (2019) on a sample of 42355 young Canadians, where 8 daily screen time hours are exceeded (i.e., TV, playing video games, computer, talking on the phone, browsing the Internet, and sending text messages). At a national level, the results found in this study are much higher than those found with Spanish adolescents, who reported mean screen time of less than 5 hours (Aibar et al., 2015; Lizandra et al., 2019). These differences, in terms of mean daily screen time, may be due to several aspects, including cultural (Roman-Viñas et al., 2016), and socioeconomic aspects (Mielke, Brown, Nunes, Silva, & Hallal, 2017), and also the number and diversity of electronic devices assessed in each study, as well as the inherent evolution of society.

Likewise, only 4% of young people from the sample of this study complied with screen time recommendations (<2 hour/day), with the percentage being higher on weekdays (9.6%) and lower at weekends (2.3%). The results of this study show a much lower degree of compliance with recommendations compared with other studies reviewed in scientific literature. For example, at an international level, a recent systematic review indicated, in the 19 studies analysed, that 52.3% of young people satisfied screen time recommendations (Thomas et al., 2019). At a national level, the study revealed that 51.6% of adolescents satisfied these recommendations (Mielgo-Ayuso et al., 2017). Therefore, given the negative effects of the excessive use of electronic devices on physical, psychological, and social health (e.g., more likelihood of being overweight or obese, as well as stress or anxiety; Fang et al., 2019; Stanczykiewicz et al., 2019), the implementation of intervention programmes aimed at reducing screen time in young people seems necessary.

If we analyse the degree of compliance with screen time recommendations in terms of each electronic devices, the least satisfied refers to the mobile phone, followed by video games, TV, and computers. These results differ respect to most previous national and international studies, where TV was the electronic devices that young people used the most (Arundell et al., 2016; Mielgo-Ayuso et al., 2017; Sevil-Serrano, Aibar-Solana, Abós, Julián, & García-González, 2019). Therefore, in addition to the perceived increase in sedentary screen time in adolescents from this sample, a shift can be seen in the type of electronic devices used today, compared with those used some years ago. These results are in line with the study by Auhuber et al. (2019), which analysed the usage of different electronic devices in the years 2011 and 2017, finding a significant increase of around 15% in the use of the mobile phone between the two years analysed. In contrast, no significant changes were found in this study in terms of total screen time and the rest of the electronic devices analysed (i.e., TV, computer and video games). Likewise, in the latest report, "*Teens, social*

media & technology", an increase of 22% is also noticed in adolescents who had access to a smart phone between 2014 and 2018, amounting to 95% today (Anderson & Jiang, 2018). The increase in time spent on the mobile phone could be due, among other aspects, to the multiple functions (i.e., alarm, diary, camera, etc.), applications (i.e., WhatsApp, Instagram, Twitter, etc.), and to the permanent Internet connection that these devices have today (Borzekowski, 2019; LeBlanc et al., 2017). Therefore, it seems necessary for future research studies to determine effective guidelines and strategies for a responsible use of these electronic devices by adolescents, paying special attention to the use of mobile phones.

On the other hand, the second research objective was to identify the differences in usage time and recommendations of these technological media according to gender and type of day. In agreement with national (Aros et al., 2017; Fundación Gasol, 2018; Mielgo-Ayuso et al., 2017) and international studies (Bucksch et al., 2016), the young people of this study spend more screen time on all the electronic devices analysed at weekends than on weekdays. This fact may mainly be due to the fact that adolescents have more free time at weekends as they have no classes or other possible out-of-school activities, and that socially it appears to be time spent on more sedentary passive leisure. Therefore, it seems necessary to promote active leisure, specially at weekends, to reduce the consumption time of these devices.

Regarding gender, no significant differences were found in the mean daily screen usage time, between weekdays and weekends. In this same vein, no significant association was found with compliance with screen time recommendations, on weekdays and at weekends between boys and girls. Although these results are not in line with a previous systematic review in which boys reported, generally speaking, higher mean screen time values than girls (Tripathi & Mishra, 2019), in another systematic review no differences were obtained between boys and girls, consistent with the results found in this study (Thomas et al., 2019). The assessment in this study of the time spent on the mobile phone, unlike previous studies that did not analyse this, could explain the lack of differences between both genders, given that, in this study, girls obtained higher mean values. This could be due to the fact that girls spend more time than boys interacting with other people, and using social media (Twenge et al., 2019). Likewise, the girls of the present study obtained higher values in mean daily usage time of computers and in mean usage time of computers on weekdays. Previous studies, such as that of Bucksch et al. (2016), determined that computers were used more often by boys for video games, while girls used it for other activities not related to games. However, the fact that the time spent on video games, using any electronic devices (i.e., mobile phone, computer, etc.), has been assessed in this study could explain why the

type of usage of computers in boys was lower in this study. In contrast, the findings determined greater mean usage time of video games in boys. The nature of many video games that focused on exacerbated competitiveness and on violence, could explain why girls use these electronic devices less (Hartmann, Möller, & Krause, 2014). In this sense, the video game industry market preferably earmarks the male gender. Therefore, the results found in this study are consistent with the systematic review of Thomas et al. (2019), which found that boys spent more hours on the computer and playing video games, while girls spent more time on the mobile phone (Thomas et al., 2019). Future qualitative studies seem necessary to justify why boys and girls spend more time using some electronic devices or others. Based on the findings, it seems necessary to establish specific strategies in the design of programmes for responsible screen usage by each of the genders, depending on the electronic devices addressed.

One of the main strengths of this study is that it was performed on a sample of more than 2000 adolescents from five academic years, encompassing almost all the schools in Huesca. Likewise, the inclusion of the mobile phone in the electronic devices assessed is one of the main contributions of this study compared with previous literature (Thomas et al., 2019). However, this work presents some limitations that should be acknowledged. Based on each one of them, a series of prospective studies are proposed to advance in this research field.

The main limitation of the study is that, although the questionnaire used is validated in Spanish adolescents (Rey-López et al., 2011; Sánchez et al., 2018), the data collected could be subject to certain subjectivity on compiling the perception of young people. To obtain a more precise measurement of screen time, recent works have determined the need to assess sedentary screen time through a more objective measure. For example, some recent studies have used different mobile phone applications, as measurement instruments, to more objectively determine the total minutes of screen usage (e.g., measuring the number of minutes that the screen was on each hour) (Andrews, Ellis, Shaw, & Piwek, 2015; Christensen et al., 2016; Loid, Täht, & Rozgonjuk, 2020). Therefore, future research could additionally incorporate objective measurement instruments that may overcome the possible subjectivity bias in data-collection. Likewise, it would be interesting to assess, in each electronic device, not only the consumption but also the consistency, content and context (Borzekowski, 2019). The emergence of many different new behaviours associated with electronic devices (e.g., television payment film channels, social media, etc.) generate a need to analyse the behavioural complexity of electronic devices in greater depth.

On the other hand, the number and typology of electronic devices analysed in the different studies reviewed in scientific literature make it difficult to be able to compare the results found. Likewise, the electronic devices (e.g., time spent talking, playing video games, sending messages, etc. on the mobile phone) is assessed, whilst in other studies the time spent on video games in different electronic devices (e.g., mobile, tablets, video game consoles, etc.) is analysed. As a prospective study it would be interesting to unify the assessment mode of the different electronic devices to be able to make a more rigorous comparison of the time spent on each device between the different studies. Moreover, it would be interesting to incorporate all the electronic devices used today into future studies, analysing both screen time and the recommendations for each electronic device individually and all of them together.

Further, another limitation of the study is that it is complicated to determine the screen usage time in those cases where two or more behaviours (i.e., multitasking) could be done at the same time, such as, for instance, sending text messages using the WhatsApp application whilst watching TV. This could mean that the screen time reported by the adolescents in this study for each electronic device might be less than the time really used.

Another feasible limitation of the study is the possible use in motion of the different electronic devices (e.g., walking whilst talking on the mobile phone). Although in video games it was specified that they had to be passive in other electronic devices, that evaluation was not made. Thus, future studies should determine the sedentary and active usage time of the different electronic devices, assessing the possible simultaneous use of these devices (Toh, Howie, Coenen, & Straker, 2019). For example, some recent studies objectively determined, through the individual use of cameras by people, the active and passive use of the different electronic devices, the environmental context, and the simultaneity of the behaviours (i.e., multitasking) (Smith, Galland, de Bruin, & Taylor, 2019).

CONCLUSIONS

Most of the adolescents from the sample do not comply with screen time recommendations, especially at weekends. Given the high daily screen usage time in adolescents, especially of the mobile phone, the development and implementation of school programmes that promote a responsible use of the different electronic devices seems necessary, placing special emphasis on the weekends as a period of special importance, due to their greater prevalence and to the educational potential they present. Likewise, the differences found in the use of the different electronic devices according to gender suggest the importance of developing specific strategies for a responsible use of video games in boys, and of mobile phones and computers in girls.

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